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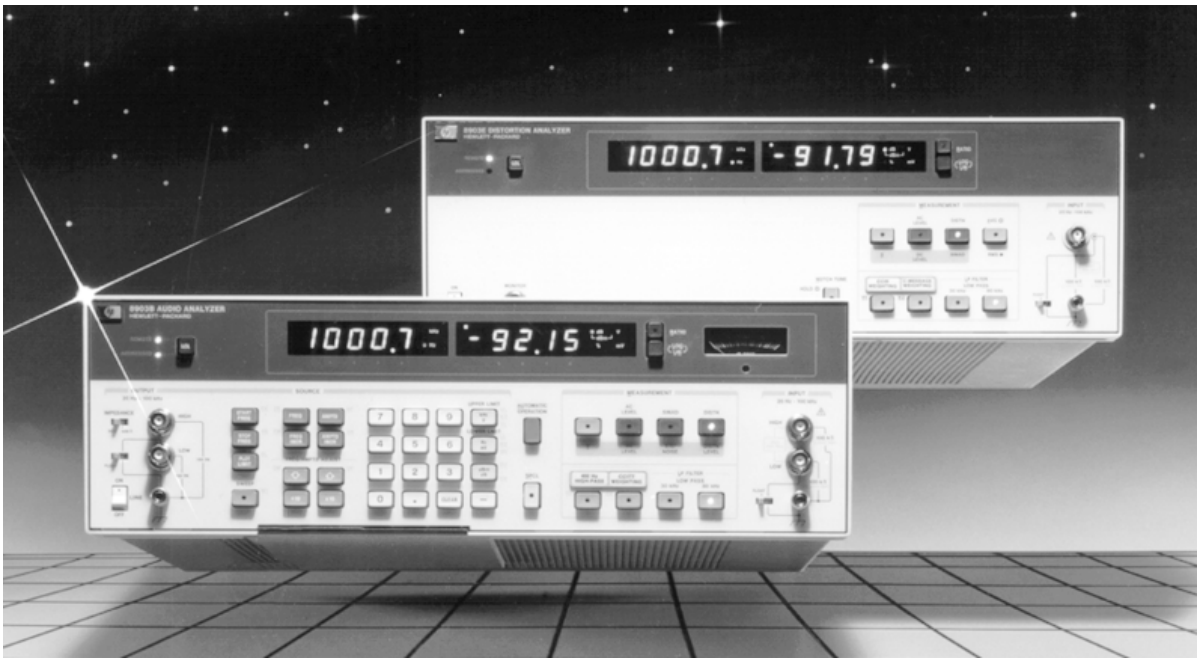
HP 8903B/E Audio Analyzer/Distortion Analyzer, 20 Hz to 100 kHz

Overview



Versatile

The HP 8903B Audio Analyzer and HP 8903E Distortion Analyzer provide unparalleled versatility and performance for audio measurements from 20 Hz to 100 kHz. Both instruments combine the functionality of a high-performance distortion analyzer, frequency counter, ac voltmeter, dc voltmeter, and SINAD meter into one compact package. In addition, the HP 8903B has a low-distortion audio source which allows it to perform stimulus-response measurements, such as signal-to-noise ratio, automatically with no additional equipment.

Accurate

For accurate measurement of complex waveforms and noise, the analyzers use true-rms detection. Average (rms calibrated) and quasi-peak detection are also available via front panel control. Accurate distortion measurements can typically be made down to less than –90 dB (0.003%) between 20 Hz and 20 kHz. Over the same frequency range, flatness measurements are possible to 0.05 dB (0.5%).

The analyzers precision reciprocal counters give you fast, accurate characterizations of audio frequencies. For example, when counting a 1 kHz signal, the analyzers will be accurate within ±0.14 Hz.

Simple

For ease of use, most measurements are made with one or two keystrokes. Both analyzers automatically tune and autorange for maximum accuracy and resolution. For quick identification of input signals, the analyzers count and display the input frequency in all ac measurement modes. The HP 8903B can also measure distortion of one signal while generating another frequency, because analyzer tuning and source frequency are independent.

Features/Measurements	HP 8903B	HP 8903E
Audio Source	✓	
50/600 Ω Output Impedance	✓	
Fully Programmable	✓	✓
Balanced Input	✓	✓
Frequency Counter	✓	✓
Distortion	✓	✓
SINAD	✓	✓
AC Volts	✓	✓
DC Volts	✓	✓
RMS/Average/ Quasi-Peak Detection	✓	✓
Plug-In Filters	✓	✓
Distortion Level	✓	✓
Signal-To-Noise	✓	✓
Sweep	✓	

Audio Applications

The HP 8903B Audio Analyzer and HP 8903E Distortion Analyzer make your audio measurements fast and easy. The analyzers automatically tune and autorange for maximum accuracy and resolution. Distortion, frequency response, ac and dc voltage measurements are only a single keystroke away. With a built-in low distortion audio source, the HP 8903B is ideally suited to stimulus-response applications. Microprocessor control of source and analyzer allows the HP 8903B to perform swept measurements. For applications where a separate source is used, the HP 8903E is an ideal lower-cost solution.

Transceiver Tests

Both the HP 8903B and HP 8903E are optimized for receiver testing. For SINAD measurements, extra filtering and smoothing circuits yield more accurate and repeatable results. With its built-in source, the HP 8903B makes signal-to-noise measurements on AM receivers using similar smoothing techniques. Transmitter testing is also easy. In conjunction with the HP 8901A, HP 8901B or HP 8902A modulation analyzers, you can measure transmitter distortion, frequency response, and count squelch tones. The HP 8903B also provides the audio tones to modulate the transmitter.

ATE Systems

HP-IB control of all measurement functions makes the analyzers valuable tools for ATE applications. These analyzers combine the power of a digital voltmeter, frequency counter, and distortion analyzer into one instrument. Since these functions are all available at one input connector, interfacing requirements, hardware costs, and software development time are reduced. The HP 8903B also includes a low-distortion programmable audio source.

Audio Applications

The analyzers have many features which make difficult audio measurements easy. These include flexible data display formats, balanced analyzer input, plug-in filters, fully-automatic notch filter tuning, and for the HP 8903B, convenient audio source control and swept measurements. Complete control over display formatting gives you a choice between volts, millivolts, dBm into 600 ohms, and watts for ac level measurements or percent and dB for distortion measurements. Using the ratio key, you can establish a reference in percent or dB and directly make frequency response and 3 dB bandwidth measurements with out computation.

Balanced Analyzer Input

In the quest for higher output power, many audio amplifiers use bridged output stages. Such amplifiers can be difficult to characterize because their outputs cannot be grounded. To test these devices, the usual approach has been to use a balanced, calibrated isolation transformer connected to an analyzer with an unbalanced input. Balanced inputs on the HP 8903B and HP 8903E make transformers unnecessary. Simply float the analyzer input and connect the bridged device directly and you are ready to make measurements.

Choose the Filters for Your Applications

Internal plug-in filters simplify your audio measurements by providing weighting networks required by international standards. Among the filters available are the CCIR weighting filter, CCIR/ARM weighting filter, and the ANSI "A" weighting filter. In addition to these filters, both analyzers come with selectable 30 kHz and 80 kHz low-pass filters to reject unwanted out-of-band signals and noise.

Filters	Standard	Optional*
80 kHz Low-Pass	✓	
30 kHz Low-Pass	✓	
400 Hz High-Pass		✓
CCITT Weighting Filter		✓
CCIR Weighting Filter		✓
C-Message Weighting Filter		✓
CCIR/ARM Weighting Filter		✓
"A" Weighting Filter		✓

*These are plug-in filters; any two can be installed in either analyzer.

High-Performance Distortion Capability

Distortion measurements are fast and accurate. With a single keystroke, the analyzers count the input signal, autorange for maximum performance, and display the result. Typical time to return the first distortion measurement is 1.5 seconds with a measurement rate of two readings per second thereafter. Residual distortion and noise for the analyzer sections are specified to be less than –80 dB from 20 Hz to 20 kHz in an 80 kHz measurement bandwidth.

Simplicity in Stimulus-Response Testing

With its internal audio source and microprocessor, the HP 8903B performs swept frequency response, swept distortion, and signal-to-noise measurements automatically.

Making swept measurements with the HP 8903B is very easy. For example, to check the frequency response of an active filter, only a few steps are required. After connecting the device and setting the required source level, you need only to enter the sweep start and stop frequencies, and then press the sweep key.

Automatic Signal-to-Noise Measurements

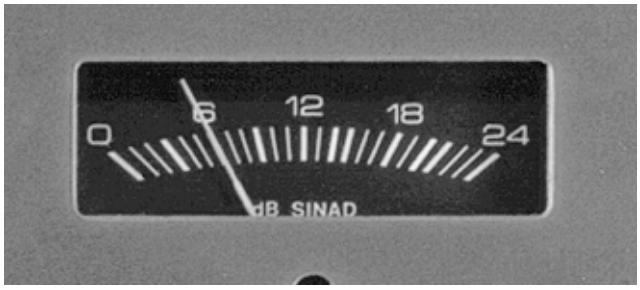
For signal-to-noise measurements, the HP 8903B monitors the ac input while turning the source on and off and displaying the ratio. With optional plug-in filters, you can perform weighted signal-to-noise measurements easily, accurately, and in real time.

Transmitter and Receiver Tests

The analyzers have several measurements and features which have been designed specifically for transceiver tests. These include SINAD measurements, optional plug-in weighting filters for testing to CEPT, EIA, CCIR, and Bell standards, rms detection for accurate noise readings, a reciprocal counter for measuring squelch tones and, with the HP 8903B, signal-to-noise ratio measurements.

SINAD, Designed for the Real World

SINAD measurements, which are one of the most common FM receiver tests, must be made repeatedly when checking receiver sensitivity or adjacent-channel selectivity. In order to smooth out the noisy signals found in receiver testing, the analyzers' SINAD mode employs extra filtering circuits. These circuits have been optimized for high speed (more than two readings per second) and excellent repeatability. The HP 8903B overcomes the tendency of many automatic analyzers to become unlocked in SINAD mode by tuning its notch filter to the source frequency. Since it has no internal audio source, the HP 8903E tunes its notch filter to the input frequency. To make sure that the HP 8903E does not become unlocked when measuring noisy signals, a front-panel notch-hold key allows you to lock the filter to a given input frequency.



Optimized SINAD Display

To reduce digit flicker, the analyzers round off the display to the nearest 0.5 dB for SINAD ratios less than 25 dB. As an extra aid in reading noisy signals, the HP 8903B adds an analog SINAD meter which displays rations less than 24 dB.

Filters for Transmitter and Receiver Applications

With two internal filter positions and six optional plug-in filters to choose from, you can tailor the analyzers to fit your applications. The CCITT, CCIR, and C-message weighting filters meet international standard for receiver testing. For transmitter testing, a seven-pole 400 Hz high-pass filter is available to reject sub-audible squelch signals. Providing greater than 40 dB rejection of signals up to 250 Hz, the analyzers' 400 Hz high-pass filter allows you to measure transmitter audio distortion to 1% without disabling squelch signals.

ATE Systems

Accurate Signal Detection

In order to accurately characterize signals with high noise content, as found in receiver SINAD measurements, true-rms detection is required. The analyzers employ true-rms detection for all signals with crest factor less that three. In addition, average detection (rms calibrated) and quasi-peak detection (CCIR 468-4) are also available via front panel control.

Generate and Count Tone Bursts

Under HP-IB control, the analyzers use their reciprocal counters to count tone-burst sequences. Maximum count rate for the Rapid Frequency Count mode is six milliseconds per reading. With the HP 8903B, you can generate tone burst sequences. Minimum tone duration is three milliseconds, which is fast enough for such applications as unsquelching pagers.

Signal-to-Noise Ratio for Receivers

Just as SINAD measurements are most often performed on FM receivers, signal-to-noise ratio measurements are usually employed as a measure of signal quality on AM receivers. The HP 8903B automatically makes signal-to-noise ratio measurements by monitoring the ac level while turning its source on and off. Like SINAD, signal-to-noise mode in the HP 8903B uses display rounding and filtering to reduce the effects of noise on the measurement.

Simple but powerful programming, combined with HP-IB control of all major functions, make the analyzers valuable tools for the automatic test equipment environment. All analyzer function are available at one input connector, reducing hardware and software development time and costs. Many ATE systems require automated measurements to determine the quality of audio signals. The analyzers provide distortion and SINAD measurements with an acquisition time of less than 1.5 seconds and a measurement rate of greater than two reading per second after locking. Another application often found in ATE systems involves measuring low-level ac signals. With a full-range ac-level display of 0.3000 mV and an accuracy of 2% of reading (V_{in} >50 mV, 20 Hz to 20 kHz), the analyzers accurately characterize these small ac signals.

Flexible ATE Source

The HP 8903B has enhanced ATE capabilities with its internal low-distortion source. Rapid-source programming mode enables the internal oscillator to be directly programmed through HP-IB with five bytes. Additionally, the source has switchable output impedance (50 or 600 ohms). With a choice of source output impedance, you can match the HP 8903B to the instruments in your ATE system. In the 50-ohm position, the HP 8903B delivers +17 dBm into a 600-ohm load.

Condensed Specifications

HP 8903B System Specifications

(HP 8903B only, source and analyzer combined)

Distortion

Residual Distortion and Noise (the higher of):
80 kHz BW: –80 dB or 17 μV, 20 Hz to 20 kHz.
500 kHz BW: –70 dB or 50 μV, 20 Hz to 50 kHz.
–65 dB or 50 μV, 50 kHz to 100 kHz.

HP 8903B Source Specifications

(HP 8903B only)

Frequency

Range: 20 Hz to 100 kHz

Accuracy: 0.3% of setting

Output Level

Range: 0.6 mV to 6 V open circuit

Accuracy:
2% of setting 60 mV to 6 V, 20 Hz to 50 kHz.

Flatness (1 kHz reference):
±0.7% (±0.06 dB), 20 Hz to 20 kHz.

Distortion and Noise (the higher of):
80 kHz BW: –80 dB or 15 μV, 20 Hz to 20 kHz.
500 kHz BW: –70 dB or 38 μV, 20 Hz to 50 kHz.
–65 dB or 38 μV, 50 kHz to 100 kHz.

HP 8903B and HP 8903E Analyzer Specifications

Distortion

Fundamental Frequency Range: 20 Hz to 100 kHz

Accuracy:
±1 dB, 20 Hz to 20 kHz.

Residual Distortion and Noise (the higher of):
80 kHz BW: –80 dB or 15 μV, 20 Hz to 20 kHz.
500 kHz BW: –70 dB or 45 μV, 20 Hz to 50 kHz.
–65 dB or 45 μV, 50 kHz to 100 kHz.

SINAD

Fundamental Frequency Range: 20 Hz to 100 kHz

Residual Distortion and Noise: Same as listed under distortion

Accuracy:
±1 dB, 20 Hz to 20 kHz.

AC Level

Full Range Display: 300.0 V, 30.00 V, 3.000 V, 0.3000 V, 30.00 mV, 3.000 mV, 0.3000 mV.

Accuracy: (rms and average detection)
±2%, 50 mV to 300 V, 20 Hz to 20 kHz.

DC Level

Full Range Display: 300.0 V, 48.00 V, 16.00 V, 4.000 V.

Accuracy: ±1.0% of reading (600 mV to 300 V).
±6 mV (V_{in} <600 mV).

Frequency Measurement

Measurement Range: 20 Hz to 150 kHz. (20 Hz to 100 kHz in distortion and SINAD modes.)

Accuracy: ±(0.004% plus one digit).

Standard Audio Filters

30 kHz Low-Pass Filter

80 kHz Low-Pass Filter

HP 8903B and HP 8903E Analyzer Specifications *continued*

Plug-In Audio Filters

400 Hz High-Pass Filter

CCITT Weighting Filter (CCITT rec. P53)

CCIR Weighting Filter (CCIR rec. 468-2)

C-Message Weighting Filter (per BSTM 41004)

CCIR/ARM Weighting Filter (CCIR rec. 468-2, average-responding meter, Dolby Labs Bulletin No. 19/4)

"A" Weighting Filter (IEC rec. 179 and ANSI S1.4, type one sound-level meter)

Analyzer Input

Input Type: Balanced (full differential).

Maximum Input: Maximum peak input voltage, any combination of ac and dc:

HP 8903B: 425 volts peak, applied differentially or between either input and ground.

HP 8903E: 42 volts peak, low side to ground. 425 volts peak, differentially or high side to ground.

General

Temperature: Operating, 0 °C to 55 °C: storage, –55 °C to 75 °C.

Weight:

HP 8903B: Net 12.3 kg. (27 lb.); shipping 16.4 kg. (36 lb.)

HP 8903E: Net 11.8 kg. (26 lb.); shipping 15.9 kg. (35 lb.)

Dimensions: 146 mm H × 425 mm W × 462 mm D. (5.75 × 16.8 × 18.2 in.)

Analyzer Mainframes

HP 8903B Audio Analyzer

Option 001: Rear panel input and output

Option 910: Provides additional operation/ calibration manual (08903-90079)

Option 915: Add service manual (08903-90062)

Option W30: Three year return repair service

HP 8903E Distortion Analyzer

Option 001: Rear panel input and output

Option 910: Provides additional operation/ calibration manual (08903-90053) and two service manuals (08903-90065)

Option 915: Add service manual (08903-90065)

Option W30: Three year return repair service

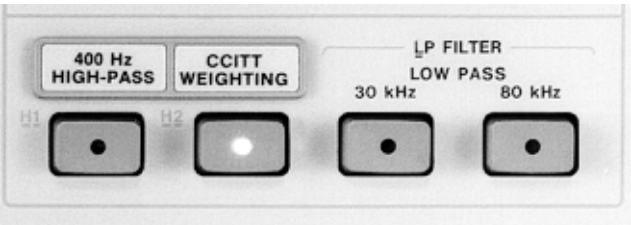
Options for both HP 8903B and 8903E

Option 907: Front handle kit

Option 908: Rack flange kit

Option 909: Rack flange kit with front handles

Ordering Information



Internal Plug-In Filter Options

Two band-limiting low-pass filters are standard. Optional high-pass and weighting filters can be fitted to match your requirements.

Both the HP 8903B and 8903E have two plug-in filter positions which can be loaded with any of six optional filters. The standard HP 8903B and 8903E come with no plug-in filters. You must order the appropriate filter options if you wish to have any of the filters listed below. Each filter option ordered adds additional cost to the instrument.

Filter Options	**Option Numbers** Filter Positions	
Filters	Left	Right
400 Hz High-pass	010	050
CCITT weighting filter	011	051
CCIR weighting filter	012	052
C-Message weighting filter	013	053
CCIR/ARM weighting filter	014	054
"A" weighting filter	015	055

Related HP 8903B Audio Analyzer, HP 8903E Distortion Analyzer Literature:

Technical Specifications 5968-1390E

Price List 5968-1389EUS

Warranty Information

This Hewlett-Packard instrument product is warranted against defects in material and workmanship for a period of one year from date of shipment. During the warranty period, Hewlett-Packard Company will at its option, either repair or replace products which prove to be defective.

For warranty service or repair, this product must be returned to a service facility designated by HP. Buyer shall prepay shipping charges to HP and HP shall pay shipping charges, duties, and taxes for products returned to HP from another country.

HP warrants that its software and firmware designated by HP for use with an instrument will execute its programming instructions when properly installed on that instrument. HP does not warrant that the operation of the instrument, or software, or firmware will be uninterrupted or error free.

Limitation Of Warranty

The foregoing warranty shall not apply to defects resulting from improper or inadequate maintenance by buyer, buyer-supplied software or interfacing, unauthorized modification or misuse, operation outside of the environmental specifications for the product, or improper site preparation or maintenance. No other warranty is expressed or implied. Hewlett-Packard specifically disclaims the implied warranties of merchantability and fitness for a particular purpose.

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